

## Output Versus Productivity Growth as Reform Performance Indicators

As argued earlier, during the initial years of agricultural reform, the growth of output was an inappropriate indicator of reform progress. Once the short- to medium-term negative output effects of market liberalization have subsided, would output become a valid indicator of reform success? We maintain that in the long run, as well as short run, output is an inappropriate performance indicator. Rather, growth in productivity—output per unit of input used in production—is the single best measure of reform progress. A way to argue this point is to examine how agricultural production could increase in the future in transition economies, and in particular how productivity growth and output are related.

### Productivity Growth and Output

One way the transition economies could raise agricultural production is by adopting policies that reverse the market-driven contraction resulting from market liberalization. These policies might include higher budget subsidies to the agricultural sector, greater state control over prices (for both inputs and output), which would be set to agricultural producers' advantage, and more trade restrictions.<sup>18</sup> Such policies, though, would be wholly inconsistent with market reform. Any resulting rise in output would therefore be a measure not of the progress of reform but of its negation. Thus, the main reason output is a flawed indicator of reform progress in agriculture is that one could not easily determine whether any growth was the result of effective market-consistent reform policies or anti-reform policies.

One might argue that production could be stimulated by higher GDP growth that raised consumer income, thereby boosting demand for foodstuffs. Higher demand for food would increase prices for producers, thereby motivating more output. Some high-level officials in transition economies have argued that demand-stimulating GDP growth is agriculture's best hope for an output rebound.

<sup>18</sup> Most transition economies have not wholly eliminated subsidies or state controls over prices and trade. Most, however, are closer to the free market and trade scenario depicted in figure 4 than to the pre-reform scenario in figure 1.

This argument holds, however, only for countries largely insulated from the world market. As mentioned earlier in this report, if a country is generally free-trading and its domestic market is well-integrated into the world market, world prices determine its domestic prices, independent of the level of domestic demand. If a country were a net importer of a certain foodstuff, an increase in domestic demand for the good from growing consumer income would be satisfied by additional imports, not additional domestic production. If a country were a net exporter of the good, higher consumer demand would reduce exports, leaving domestic output unchanged. This effect can be seen in figure 4, where we assume again that a country is facing world price  $P^2$  for a good and importing  $Q^1Q^4$ . A shift to the right of the demand curve increases domestic consumption and imports, but not domestic production.

The main way to raise agricultural output consistent with a market-driven and free-trading economy would be through positive supply-side developments. Two such developments are possible: effective farm-level changes, of the type imagined by the forecasting studies examined earlier, that increase productivity; and more vigorous development of both commercial and public infrastructure and institutions that a market-driven agricultural economy needs.

Farm-level changes could spur productivity growth in three general ways. The first way would be simply to shed unproductive inputs, particularly labor. The agricultural labor force in virtually all transition economies is inefficiently large, as shown by the fact that agriculture's share in the total labor force is much higher than agriculture's share in GDP. In most countries, primary agriculture accounts for 15-30 percent of the total labor force (compared with only 2 percent in the United States and about 5 percent in the EU), while agriculture's share in GDP is about 10-20 percent.

This form of agricultural productivity growth—excess labor moving out of agriculture to new employment—expands output not in agriculture, but in the industries to which the labor moves. Unlike with the two other ways of increasing productivity that will be discussed, agriculture itself does not receive a production boost. Shedding excess labor has the advantage that productivity can rise in agriculture without necessarily having to change the nature and system of farm-level production. The transfer of labor to off-farm employment, however, requires reform developments outside

of agriculture, that is, the generation of new nonagricultural jobs. In the transition context, this would come from economy-wide liberalization, particularly in services, which quickly creates new employment opportunities. Macours and Swinnen (forthcoming) find that economy-wide liberalization is positively correlated with the growth of labor productivity in agriculture. Concern that discarded low-skilled labor might be unable to find new jobs has been a major obstacle to systemic reform in transition agriculture.<sup>19</sup>

The second way farm-level changes could raise productivity would be for less productive farms to rise to the productivity and efficiency level of the current top-performing farms in their country. This improvement in *technical efficiency* by farms moving closer to the production practices of their country's best farms is also achievable within a country's existing production technology. One way farms could increase usable output in this manner would be to reduce the tremendous waste of harvested output during the stages of storage, transportation, and processing, a systemic weakness inherited from the pre-reform period (Johnson, 1993). This would raise productivity and efficiency measured from the point of view of the entire agro-food economy.

The third way farm-level changes could increase productivity would be to adopt new technologies of production (*technological change*). The new "technology" could involve improvement not only in the technical means of production, but also in the way farms are organized, managed, and motivated. For example, Macours and Swinnen (forthcoming) find that the creation of *user rights* for farmland is positively correlated with growth in agricultural labor productivity (as well as with growth in output). User rights motivate productivity growth by providing farmers security of tenure in their land (if not strictly as owners, at least as users), thereby improving farmers' incentives to

<sup>19</sup> One of the simulation scenarios in the ERS study on restructuring in transition economies' livestock sector (Cochrane, 2002) examines the effect on employment, production, and trade from the movement of labor out of the sector to nonagricultural jobs. In the simulation, investment in nonagricultural sectors in Poland, Romania, and Russia is assumed to rise 15 percent, which by increasing wages draws labor from agriculture. As expected, output in the sectors receiving the investment rises while livestock production falls, which in turn increases imports of livestock goods. The main conclusion of the scenario is that in order for a significant amount of labor to be enticed to nonagricultural employment, wages must rise substantially.

work efficiently and invest in their farms. Foreign direct investment could play a key role in transferring both superior technology and management practices to transition agriculture.

The other major supply-side development that could increase support would be to improve both the commercial and public institutional infrastructure that a market-driven agricultural economy requires. As discussed earlier in this report, major institutional needs include well-operating systems of market information, rural banking and finance, and commercial law. By lowering transaction costs, such infrastructural services would make domestic agricultural output more price competitive vis-à-vis the world market (which for many countries means competing with imports sold in their large cities). In figure 4, the drop in transaction costs would shift the supply curve to the right, stimulating output and improving the trade balance of the good in question.

Lerman (1999, 2000) finds that a correlation exists between GDP growth in transition economies and growth in agricultural output. GDP growth not only increases the quantity of agricultural inputs (including physical capital) available to farms, but also results in development of the agricultural services and commercial infrastructure that farms need to function and reduces operational and transaction costs. Thus, the success of economy-wide reform and growth appears to be a key factor in the prosperity and growth of agriculture.

Another simulation scenario in the ERS study on restructuring in the livestock sector (Cochrane, 2002) examines the effect on livestock herds and production from a decrease in transaction costs resulting from accelerated development of institutional market infrastructure. Institutional development is assumed to reduce transaction costs (represented in the study by *marketing margins*) by 20 percent in Russia, Ukraine, and Romania. The projected effect is substantial, as both herds and meat output rise 5-20 percent (depending on the country and type of meat).

It was mentioned earlier in the report that Western forecasting studies omitted the role of institutions and commercial infrastructure in predicting how reform might change the volume and mix of transition economies' agricultural production, consumption, and trade (perhaps because these elements are not easily quantifiable). Yet, Western aid has far from ignored the

importance of institutions and market infrastructure in the reform of transition agriculture. Much of the West's technical assistance effort vis-à-vis transition agriculture, as indicated by the efforts of the World Bank and European Bank for Reconstruction and Development, has focused on building such infrastructure.

Nonetheless, it seems fair to conclude that at the start of reform, Western specialists underrated how slow and difficult the creation of this infrastructure would be, as well as how crucial it is for the functioning of a market-based agricultural system. A recent World Bank report on poverty (World Bank, 2000) asserts that in formulating policies to combat poverty in developing and transition economies, as well as in helping devise social and economic policy in general, international aid organizations have paid insufficient attention to institutions.

The creation and effective operation of market-based institutions in the transition economies take time. Western technical assistance in this area should focus on education and training. While it is important that personnel in the transition economies master the technical administration of new institutions, it is equally important that public officials, as well as those whom the institutions should serve, understand why the institutions are important within the framework of a market system, and trust and respect them, particularly when their own interests conflict with maintaining the institutions' integrity. The ability of people to change their behavior in this way is a major constraint on the pace and effectiveness of reform.

The two main ways the transition economies can increase agricultural output compatible with market reform—effective farm-level changes and building of supporting institutional infrastructure—create that additional output by either raising productivity or lowering costs (both the primary costs of production and transaction costs). In fact, productivity growth and cost reduction are opposite sides of the same coin. Productivity growth allows a given level of output to be produced using fewer inputs than before, thereby lowering unit costs of production. Since productivity growth is the means to the end of market-compatible growth in output, it is a more primal performance indicator of reform success than output.

As mentioned earlier, productivity growth within an industry can result in transferring resources to produce more goods in other parts of the economy. In

the transition economies, resources will move to those industries producing goods that consumers now wish to buy but were unavailable (or provided in insufficient quantity) under the planned economy. Many goods and, especially, services that have been common in the West were completely unavailable to consumers in the pre-reform period. Therefore, another reason productivity growth is superior to output growth as a performance indicator for a particular industry is that the effect of a rise in productivity might not be to increase output in that industry. Rather, its effect might be to allow resources to be shifted to producing other goods that are either more desired by domestic consumers (particularly as tastes change), or are more competitive on the world market. Productivity growth has the benefit of raising a country's production capacity while providing flexibility as to how the country uses the increased capacity.

## Measuring Productivity Growth

The single best measure of productivity growth, not only for transition economies but for economies in general, is total factor productivity (TFP) growth. TFP growth for a good is an aggregate measure that captures the growth in productivity of all inputs used in production.<sup>20</sup>

Productivity growth can also be measured for each specific input used in production. However, the analysis of productivity growth for individual inputs must be handled with care, particularly with transition economies. During transition, the measured productivity of agricultural intermediate inputs, such as fertilizer, fuel, and machinery, has risen, in many cases substantially. On the other hand, the productivity of labor and land (as measured by yields) in general has dropped. The main reason for these developments is not that major changes have been made in the *system of production* that make intermediate inputs more productive and labor and land less so. Rather, the large increase in real prices for agricultural intermediate inputs following price liberalization has caused the use of these inputs by farms to fall to a greater degree than output. Measured productivity for these more scarcely used inputs has thereby increased. The amount of labor and land used in agriculture has also generally declined, but by less than intermediate inputs. The

<sup>20</sup> More specifically, TFP growth is the weighted average of growth in productivity of each individual input used in production, where the weight of each input equals its share in the total value of production.

larger relative drop in intermediate inputs has therefore reduced the average productivity of land and labor. Some countries, such as Hungary and the Czech Republic, are exceptions, in that their farms have managed to shed enough labor such that labor productivity has risen.

The fact that there is natural pressure within transition economies for the productivity of agricultural labor and land to drop (as just described) makes productivity growth for these two inputs relatively more acceptable as indicators of reform progress. Any positive growth in productivity of these inputs would come not from changes in the relative mix of the inputs used in production, but from an improvement in the way these inputs are used in production.

The main disadvantage of growth in productivity, as opposed to output, as a performance indicator is that productivity changes are more difficult to compute, especially in terms of data requirements. Although calculating productivity growth for individual inputs is fairly straightforward, and the required data are generally available, computing changes in TFP is much more challenging. The necessary data most difficult to obtain are the shares of each input in the total value of output. Because of the challenges involved, the research community has yet to provide anything close to a complete set of TFP calculations for transition agriculture.

## **Agricultural Productivity Performance Differs Among Transition Economies**

In general, agricultural productivity growth in the transition economies during the 1990s was disappointing, particularly in light of the expectations many had at the beginning of reform. A detailed examination of why productivity growth was lower than expected, and why some countries have done better than others, is beyond the scope of this report. Only a brief discussion will be provided. Because of the challenges of computing agricultural productivity growth, especially that of TFP, the “hard” empirical evidence one can use in a productivity assessment is only fragmentary. The following discussion is based not only on this hard evidence, but also on more anecdotal information.

The best productivity performers appear to be Hungary and the Czech Republic. Macours and Swinnen (2000a) compute that during the first half of the 1990s, these countries had the best TFP performance in crop

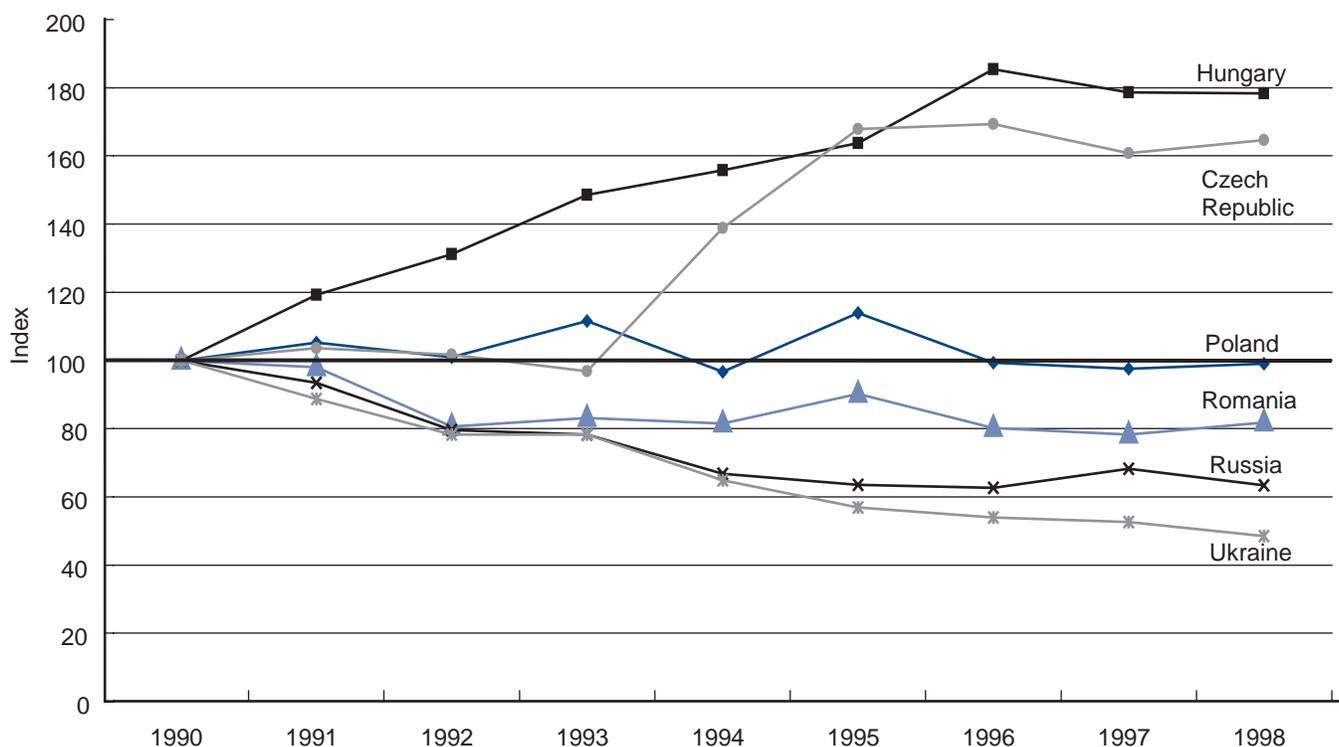
production among the CEECs. The superior performance, though, was strictly relative, because TFP grew over the 5-year period in the two countries by only 10-20 percent (total, not annual). Hungary and the Czech Republic, however, enjoyed a large increase in agricultural *labor productivity* during the 1990s, far above that of other transition economies (fig. 6).

As discussed earlier, the World Bank grades the agricultural reform effort in the 26 transition economies based on five elements: price and market liberalization, land reform and privatization, privatization and reform of agroprocessing and input supply enterprises, rural finance, and institutional reform (Csaki and Nash, 2000). Scores on these indicators should generally be correlated with productivity growth, and for some indicators, such as land reform and privatization, the correlation should be close.

Out of a maximum possible score of 10, Hungary and the Czech Republic receive the highest scores of 8.8 and 8.6, respectively. The large socialist-era farms in these two countries have turned into private, large-scale corporate enterprises. It appears that labor productivity has risen mainly because a major systemic restructuring of these farms induced them to shed substantial amounts of labor. This has been made possible by (relatively) successful economy-wide reform that generates jobs outside of agriculture (Macours and Swinnen, forthcoming) and helps finance and maintain an effective social welfare system that provides pensions and unemployment benefits for urban residents. High foreign direct investment (compared to other transition economies; OECD, 1999), in both agriculture and economy-wide, has also helped motivate this labor migration. Investment within agriculture facilitates labor-saving productivity growth, while investment in the rest of the economy creates new jobs outside of agriculture.

Productivity growth has been lower in the other CEECs, such as Poland, Bulgaria, and Romania. These countries also score lower than Hungary and the Czech Republic in the World Bank agricultural reform ranking. (The scores are 7.8 for Poland, 7.6 for Bulgaria, and 6.6 for Romania.) Some countries, such as Poland and the Baltic States, have implemented major farm-level reforms, such as creating land markets and full user rights in land. Certain of these countries, however, have also moved to a system of small private farms. (Poland already had small household farms at the beginning of reform.) Such a move can improve

Figure 6  
**Labor productivity in agriculture**



Source: Computed from data from OECD and FAO.

incentives to work and invest. On the other hand, the small farms in these countries appear to suffer from diseconomies of scale, as well as underutilized labor. Small household farms absorb surplus labor from the rest of the economy. Labor is also drawn to household farms because they often function as a more effective social safety net than national welfare systems, which are less well organized and generous in these countries than in Hungary and the Czech Republic.

With so little land on these farms for each household to work, the productivity of labor suffers. Poland and Romania had low declines in aggregate agricultural production during the 1990s (less than 10 percent) relative to most other transition economies (table 1). The main reason is not better productivity performance but greater labor employment. During the 1990s, agriculture's share in Poland's labor force was 20 percent or more, while agriculture's share in Romania rose from 28 to 36 percent. Output levels were maintained at the expense of low labor productivity.

In affecting farm performance, the diseconomies of scale of small private farms can negate much of the

benefit arising from strong incentives to work and invest. In fact, Lerman (2000) finds no conclusive evidence for the CEECs or NIS that farm size alone is correlated with productivity—neither large nor small farms are necessarily more productive than the other.<sup>21</sup>

The NIS countries generally have had the poorest productivity performance. Lerman et al. (2001) find that from 1992 to 1997, Russia had TFP growth of about 7 percent, and Ukraine, Kazakstan, and Belarus had TFP growth of only 2-3 percent. Not surprisingly, these countries also score low in the World Bank agricultural reform ranking. (Scores were 5.6 for Russia, 5.4 for Ukraine, and 1.8 for Belarus.) In most NIS countries, the former large state and collective farms continue to dominate production. Reform

<sup>21</sup> Mathijs and Swinnen (2001) find that in the former East Germany during the first half of the 1990s, medium-size partnership farms (about 400-500 hectares) were more efficient producers than either family farms or large former state and collective farms. Partnerships and family farms both had better technical efficiency than former state and collective farms, presumably because of superior incentives to use labor well, while partnerships enjoyed economies of scale compared with family farms.

## Productivity Growth and Comparative Advantage in Agriculture

Just as productivity growth in a particular industry might not necessarily result in a rise in output in that industry, productivity growth might also affect trade differently than one might at first think. This point will be discussed specifically with respect to the grain trade of the NIS countries. Earlier in this report, it was explained that the fears of Western agribusiness that reform might turn the NIS region into a major grain exporter have not been realized. This is largely because reform has not generated the productivity increases that would result in large surplus production. However, even if reform succeeded in raising productivity in grain production, this effect might be insufficient to move the region toward grain exports.

During the last few years, the NIS region has been neither a big importer nor exporter of grain, the annual trade balance for the region being just a few million metric tons of either imports or exports. The *isolated effect* of productivity growth in grain would probably be to improve the trade balance in the product. Productivity growth would stimulate exports by reducing per unit costs of production, thereby making domestic output more price competitive vis-à-vis imports and the world market—in other words, productivity growth would improve a country's comparative advantage in the product.

Assume, though, that productivity grows uniformly throughout the region (for all inputs used to produce all goods), say by 50 percent. Because of the inverse relationship between productivity growth and costs of production, production costs for all goods would fall also by a uniform percentage. (Under standard assumptions, the per unit costs would drop by one-third.) Since comparative advantage depends on relative costs and prices, the region's structure of comparative advantage would not change. If the region were a relatively high-cost producer of a good before the uniform productivity increase, it would remain a relatively high-cost producer of the good, because per unit costs for all goods would change by the same percentage. This means that if the region were a net importer of a good (say grain) before the productivity growth, it

would be economically profitable for the region to continue importing the good.

This point can be reconciled with figure 4. Assume again that both the world and domestic price equal  $P^2$  and the country in question is importing  $Q^1Q^4$ . Economy-wide productivity growth would shift the supply curve for the good in question to the right. However, by lowering the production cost of all goods by a uniform percentage, the productivity rise should appreciate the country's currency (under standard assumptions by an amount equal to the productivity growth). The appreciation would lower the good's world price expressed in domestic currency, which means the domestic currency price  $P^2$  would fall. The drop in price would increase domestic consumption and reduce domestic production. Thus, the country's import trade balance in the good might change little. Liefert (1994) examines the relationship between productivity growth and comparative advantage, particularly as applied to transition agriculture.

The following example further illustrates the relationship between productivity growth and comparative advantage. Ever since Great Britain repealed the Corn Laws in the middle of the 19<sup>th</sup> century, which opened the country up to free trade, it has been a major importer of agricultural goods. Over the past 150 years, Britain has had significant productivity growth in agriculture in absolute terms. However, because productivity growth has occurred throughout the economy, Britain remains a high-cost producer of agricultural goods relative to other goods it produces, and thereby continues to be a large agricultural importer.

If the NIS region currently does not have a comparative advantage in grain, as appears to be the case, it can develop a comparative advantage and thereby become a major exporter only if productivity growth in grain production exceeds that in most other sectors of the economy. The southern half of the European part of the NIS region has

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highly favorable natural conditions for agriculture, particularly grain production—excellent soil and climate and generally adequate (though inconsistent) precipitation. Once that region, which covers Ukraine and southern European Russia, adopts world-standard production technology, creates reasonably efficient systems of farm organization and management, and builds institutional infrastructure to service agriculture properly, it will most likely have a comparative advantage in production of

grain and various other crops, such that it should be a major exporter. This effect would be consistent with the region's history of being a large grain exporter. However, agriculture has been one of the most conservative and anti-reform sectors in the NIS economies during the transition period and gives little indication of becoming significantly more progressive during the next 10-15 years. Thus, during at least this timeframe, the likelihood that agriculture will outperform the rest of the economy in productivity growth to become a major exporting sector appears dim.

of these large farms to date has been largely cosmetic. Farms in these countries have been required officially to privatize and reorganize, with many becoming joint-stock companies owned by their managers and workers or some form of cooperative. However, little has been done to change the farms' internal systems of organization, management, or incentives for workers.

Economy-wide reform has been slower in the NIS countries than in most of the CEECs, thereby limiting both the potential for farm labor to move to off-farm employment and the availability of capital investment for farms (capital replacing labor). Also, foreign direct investment in the agro-food sector, which could bring technology transfer, has been slight.